

# Operating room of the future

St. Olavs Hospital HF, Department of Surgery

## Annual Report 2008

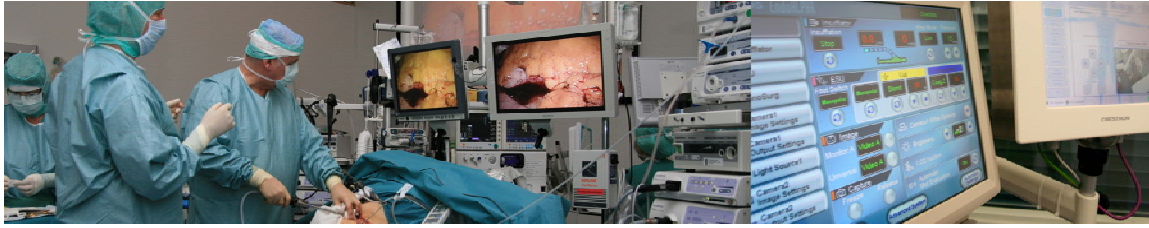


**St. Olavs Hospital**  
University Hospital of Trondheim

 **NTNU**  
Innovation and Creativity

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## **Annual Report 2008**

### **Operating room of the future (ORF), Department of Surgery and the Faculty of Medicine, NTNU**

*“The patient of today – the technology of tomorrow”*

*“A cross-disciplinary arena for clinical research and development of medical technology”*

#### **Summary**

The operating room of the future is a cooperation between St. Olavs Hospital HF, University Hospital of Trondheim and the Norwegian University of Science and Technology (NTNU), Trondheim, Norway. The day-to-day management is a responsibility shared between Department of Surgery and the Institute for Circulation and Medical Imaging, the Medical Faculty. Operating room of the future (ORF) is a stage for research and development with the operating rooms as unique “laboratories”, made to develop, test and apply new technology and new treatment modalities.

The tasks of a university hospital is legally defined in the ”Specialist health care act” and include treatment of patients, education of patients and relatives, research and teaching of health care personnel. ORF is working to fulfill all these goals.

The most important activity of this project is research to provide safer and better patient treatment, more effective logistics and flexible architecture in the construction of operating rooms in new hospitals. ORF is also a centre of competence for construction of operating rooms outside St. Olavs Hospital. A unique agreement with our industrial collaborators has made it possible for the Health Care Trust of Central-Norway, St. Olavs Hospital and NTNU to carry out research and development with special focus on image-guided minimally invasive therapy. ORF has a close collaboration with the National Centre for Advanced Laparoscopic Surgery (NSALK), the research foundation SINTEF and the National Centre of Competence – 3D-ultrasound.

The project is multidisciplinary and an arena for clinical research and development of medical technology. Prototypes can be developed and tested in safe and controlled environments. ORF is structured to promote a close collaboration between clinicians, technologists, researchers and industrial partners. The latest equipment available will be put to use at ORF.

In the “National Plan of the Norwegian Health Authorities”, Trondheim has a particular responsibility for research within the field of medical technology.

The operating rooms are equipped for minimally invasive therapy. The major focus is on key-hole surgery in the abdomen (laparoscopic surgery) and endovascular therapy of diseases in the blood vessels. Minimally invasive surgery is less traumatic than traditional surgery and will have a broader place in patient treatment in the future.

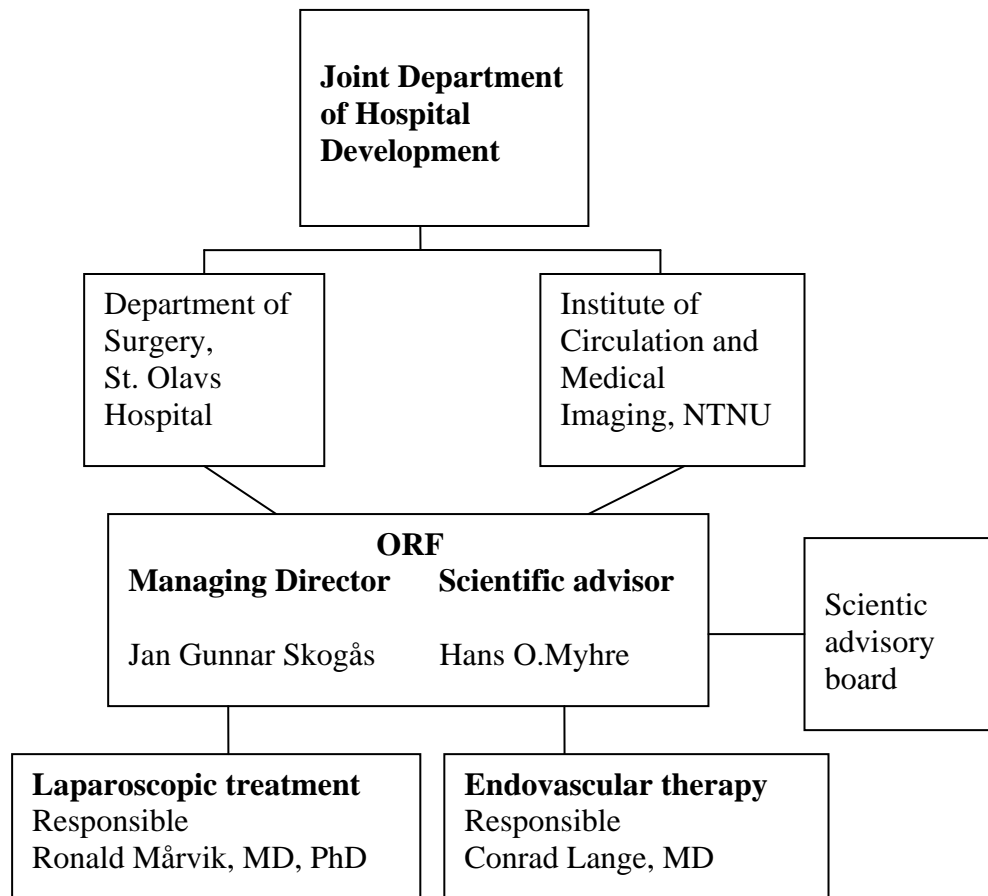
ORF also shows that the concept of cross-disciplinary and cross-professional approach is advantageous. ORF has the facilities and logistics necessary to focus on research and projects which are based on a multidisciplinary approach. Studies are performed by PhD-candidates, scientists, students and clinicians. In addition, ORF with its technical equipment and design is perfect for teaching and educating students, doctors and nurses.

New methods for teaching have been tested and transmission of images from the operating room to the lecture room with two-way communication has been used on several occasions. This has been perceived as a very valuable experience, and the intention is to develop this further, employing the excellent equipment and technological standard of the facility . At ORF and NSALK several courses are arranged annually, including courses compulsory for specialist candidates. ORF with the integrated surgical auditorium creates a unique environment for these courses.

New research projects and investigations have started in 2008 and several projects are in the planning stage.



## Organisation



### ***The staff at ORF***

- 1 managing director
- 1 scientific advisor
- 1 research collaborator endovascular activity (50%)
- 1 research collaborator/OR nurse laparoscopic activity
- 1 OR nurse, endovascular activity (50%)
- 1 X-ray technician (50%)
- 1 anesthesia nurse (50%)

### **Other personnel resources connected to ORF:**

- 1 scientific leader, endovascular activity
- 1 scientific leader, laparoscopic activity
- 1 radiologist

## ***Clinical activity***

**Altogether 236 operations were performed at ORF i 2008**

### ***Laparoscopic treatment***

A total of 121 operations have been performed at ORF for laparoscopy in 2008. This is an increase by more than 30 procedures compared to 2007. Most operations have been performed for morbid obesity. 64 of these received a gastric bypass operation (GBP). These patients are involved in a non-randomised trial where patients can choose between surgery and 18 weeks of conservative therapy including lifestyle modification. One aims for a 5-year follow-up. ORF, NSALK and Centre for Morbid Obesity are also involved in a multicenter trial, investigating a new operative technique for morbid obesity, based on the implantation of electrodes on the vagus nerve (VBLOC). Altogether four centres, in Mexico, Australia and Switzerland, are taking part in this investigation in addition to ORF/NSALK.

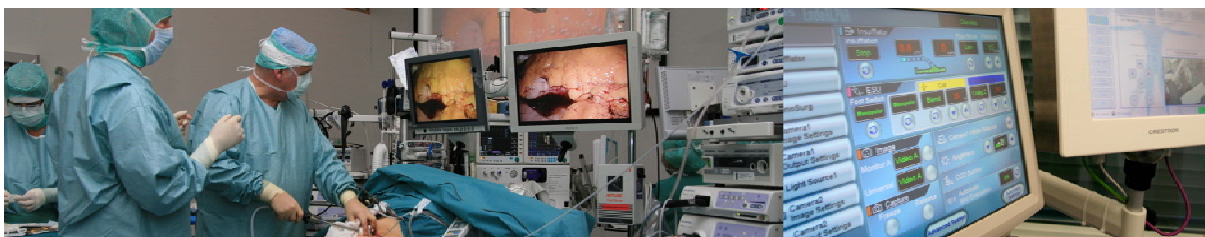
Custus X, a navigational tool developed by SINTEF, has been used during several operations including adrenalectomies. The use of this navigation equipment is tested in a clinical multicenter study together with Dept of Surgery, Mesos Medical Center, Utrecht, The Netherlands.

There have been several visitors at ORF, including participants in the European research project VECTOR, where NSALK and SINTEF are taking part. The aim of the VECTOR project is to develop a miniature robotic capsule for intraluminal gastrointestinal diagnostic and therapeutic procedures.

Several surgeons from Norway, Egypt and Japan have been visitors at ORF/NSALK for shorter periods. NSALK has three PhD-fellows at ORF at the moment.

The synergy between NSALK's simulator-based laboratory and ORF's interactive lecture room makes it possible for participants at courses and symposias to train on simulators and be present in the lecture room where they can observe procedures performed by laparoscopic/endoscopic technique. NSALK has in collaboration with Olympus developed a new operating light, which can replace regular operating lamps. The first prototypes are tested at NSALK's animal laboratory and will later be used at ORF.

NSALK/ORF received in 2008 several visitors studying the first fully equipped HD endoscopic and laparoscopic OR in Europe with digitally integrated auditorium.



In 2008, 121 operations were performed at the laparoscopic operating room

<b>Activity, laparoscopic surgery 2008</b>				
<b>Gastroenterology</b>	Laparoscopic	Funduplicatio	1	
	"	Cholecystectomi	1	
	"	Gastric bypass	64	
	"	Gastric sleeve	3	
	"	VBLOC	6	
	"	Gastric resection	1	
	"	Hepatic resection	2	
	"	Pancreatic resection	2	
	"	Hemicolectomy	2	
	"	Low anterior resection of the colon	1	
	"	Resection of the rectum	1	
	"	Sigmoid resection	1	
	"	Reop. VBLOC	1	
	"	Remove VBLOC, Gastric bypass	1	
	"	Appendectomy	1	
	"	Splenectomy	1	
			Endoluminal closure of gastric fistula	1
			Submucosal resection	1
			Gastroscopy	2
	<b>Endocrine surgery</b>	Laparoscopic	Adrenalectomy	13
<b>Urology</b>		Transurethral prostatectomy	5	
		Transurethral cystoscopy with photodynamic diagnosis	1	
		Urethrotomy	1	
		Incision of urethral stenosis	1	
		Cystoscopy	1	
<b>ENT surgery</b>		Inspection of ear drum by endoscopy	2	
		Endoscopy of Pharynx	1	
		Sialoscopy	1	
		Functional Endoscopic Sinus Surgery (FES)	1	
<b>Orthopaedic</b>		Hemiprosthesis of the hip	1	

## Endovascular treatment

Altogether 115 procedures have been performed in the endovascular operating room. Eighteen of these were emergency cases, and using ORF has become routine in treating ruptured aortic aneurysms. Percutaneous intraluminal stents has become the treatment of choice in traumatic lesions of the thoracic aorta.

Operations for iliac-, abdominal- and thoracic aneurysms have been carried out. The number of combined open and percutaneous vascular procedures is increasing. This will shorten the associated hospital stay. These procedures are a collaboration between surgeons and radiologists, and are an integral part of the training program for future vascular surgeons. The auditorium in ORF is in regular use for teaching vascular surgery to medical students, and transmission of percutaneous stent-graft procedures serves as a background for discussing patient histories and principles for handling aortic aneurysms.

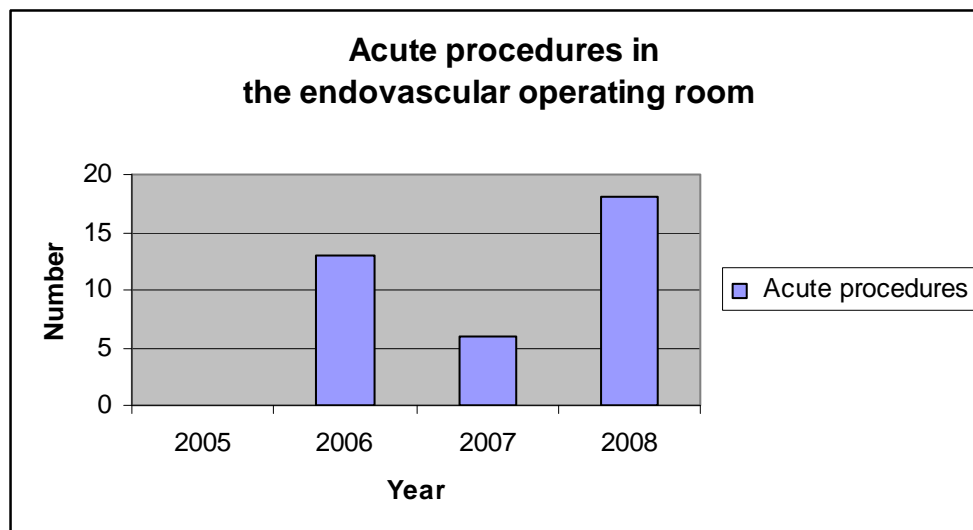
Some radiological procedures have also been performed in this room. The main intent was to test the effect of upgrading the Dyna-CT software.

As part of a research protocol, 3D-visualization with Dyna-CT was performed during elective operations for abdominal aortic aneurysms. This was done with informed consent by the 39 patients involved. Dyna-CT was also performed in other operations as pilot investigations and studies for testing of this specific imaging modality.

Dyna-CT was further used in phantom experiments, experimental surgery and testing of the navigation system for intravascular use. Navigation has been employed with catheters for placing branched intravascular stents in treatment of aortic aneurysms. Several experimental procedures have been performed using fluoroscopy.

**In 2008, 115 operations were performed in the endovascular operation room**

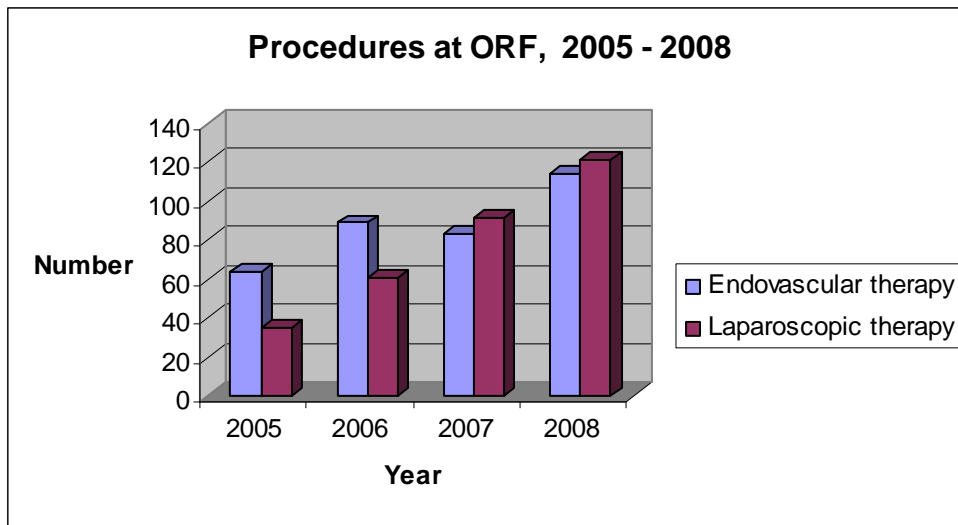
**Activity endovascular treatment:**



**I 2008 115 procedures has been performed in the endovascular suite.**

<b>Activity endovascular treatment 2008</b>		
<b>Vascular surgery / intervention</b>	Thoracic stentgrafts	8
	Abdominal stentgrafting	36
	Secondary procedures after thoracic stentgrafting	2
	Secondary procedures after abdominal stentgrafting	7
	Stentgraft, stent and angioplasty for aortoiliac arterial obstruction	21
<b>Acute procedures / intervention</b>	Thoracic aneurysms	5
	Abdominal aortic aneurysms	8
	Secondary procedures following thoracic stentgrafting	2
	Secondary procedures following abdominal stentgrafting	1
	Stentgraft for pseudoaneurysm in the common femoral artery	1
	Trombectomy and angioplasty following embolectomy	1
<b>GI Surgery</b>	Application of intraperitoneal port	1
	Stimulation of sacral nerves for anal incontinence (SNS)	21
<b>Pulmonology</b>	Bronchial stent	1





## ***New activities at OFR***

Additional surgical and medical disciplines have in 2008 used ORF for research and teaching purposes.

- Department of Urology
- Department of ENT and Maxillo-Facial surgery
- Orthopedic Clinic
- Department of Pulmonary Diseases

## ***Developing and testing technology***

In addition to the clinical activity, the operating rooms have been used for pure experimental studies. The facilities has been used for developing and testing new medical technology, prototypes and new equipment, which again has been employed in clinical trials in connection with PhD-protocols.

SINTEF has spent 23 days calibrating, testing and mounting navigational equipment. PhD candidates have used ORF for similar purposes for altogether 15 days. Internally, and in collaboration with our industrial partners, a total of 9 weeks have been spent for testing technological systems, quality control, safety control, upgrading and validating equipment.

## ***Resource center for new hospitals***

ORF is a testing ground for integrating operating rooms in hospital structures and implementing new technology and equipment. As such, our facility has been employed by the Unit for New Hospital as well as other departments at St Olav Hospital, and by Hospital Development Project for Central Norway, the contractor for our new hospital.

## ***Teaching***

### **Staff**

#### **Education**

- Medical personnel affiliated to ORF are going through annual certification according to National Regulations on Use and Maintenance of Electromedical Equipment § 13.
- ORF has a number of highly qualified personnel focusing on the use of modern, advanced medical technology. These persons are kept up to date through various courses and conferences.
- The personnel at ORF is contributing in the teaching of personnel at other departments at St. Olavs Hospital as well as personnel from other institutions, focusing on clinical procedures, research and application of medical technology.
- ORF has received visits by personnel from other hospitals, thus supplying information on new technological applications, methods and integration of laparoscopic and endoscopic procedures. Organising and designing operating rooms has been a focal area of interest. The participating institutions in 2008 have been AHUS University Hospital, Røros, Arendal, Namsos, UNN, Kristiansand, The National Hospital, Ullevål University Hospital and Aker University Hospital, Oslo.
- ORF has contributed by initiating endovascular therapy of abdominal aortic aneurysms at AHUS University Hospital. Personnel from this hospital have followed the operations at ORF and doctors from St. Olavs Hospital have assisted at procedures at AHUS.
- During a course in simulator training, arranged by The National Centre for Advanced Laparoscopic Surgery, ORF has been used as an arena for transmission of operative procedures and dissemination of information about integration of new equipment applied during these procedures.
- The personnel at ORF have during 2008 attended courses within leadership and research organisation.



## Students

- On 22 occasions operative procedures have been transmitted to the lecture room in connection with teaching medical students, nurses and radiography students as well as other professional groups at St. Olavs Hospital.
- A total of 41 live procedures has been transmitted from the operating rooms to the auditorium
- Operating room nurses and anaesthesia nurses have taken part in education and tutorial activity.
- Visitors from other hospitals have attended ORF and have been present during operations.
- Master students as well as PhD candidates at St. Olavs Hospital / NTNU / SINTEF have a good opportunity to see new medical technology and operations from the interactive surgical lecture room at ORF.

## Courses

### Hygiene and patient safety

05.02.2008	Course for technicians and research workers
20.08.2008	Course for radiography students
27.08.2008	Course for radiography students

### Electromedical equipment

24.04.2008	High Energy Equipment – Orthopedic and Rheumatology Clinic
05.06.2008	High Energy Equipment - Surgical Clinic
15.09.2008	High Energy Equipment - Surgical and Neurosurgical Clinic
16.10.2008	Imaging technology/radiation protection - Surgical and Neurosurgical Clinic
06.11.2008	High Energy Equipment - Surgical and Neurosurgical Clinic
08.12.2008	Imaging technology/radiation protection - Surgical and Neurosurgical Clinic
11.12.2008	High Energy Equipment - Orthopedic and Rheumatology Clinic

## **Medicotechnological equipment**

03.01.2008 Course for OR-nurses in training

## **Transureteral surgery**

03-04.04.2008 National Urologic Meeting

## **Week of courses 2008 NTNU**

13-17.10.2008 Medical students – live transmissions from 5 procedures and associated lectures. Hands-on course in vascular intervention



## **Conferences / other events**

05. – 07. May 2008 – Annual Meeting of Association for Medical Technology in Trondheim, Norway. Participated with a stand on the meeting.

22. - 23. May 2008 – Nordic congress for Union of Vascular Surgical Nurses. Live transmission of operation from ORF to auditorium Womens & Childrens Center at St. Olavs Hospital.

17. – 19. September 2008 – The 8th Congress of Nursing, Trondheim. Participated with a poster entitled:”Mapping of neuralgic complaints in patients operated for morbid obesity”, Anne K. Wik

15. – 16. September 2008 – Regional research and development conference, Ålesund Participated with poster entitled:”Operating room of the future –experience after 4 years”, Jenny K Aasland

## Scientific meetings

Several scientific and workshops were arranged by the ORF in 2008. Employees, associated personnel, industrial collaborators, employees at SINTEF and PhD-candidates took part in these meetings.

- 2nd June: - Workshop, Augustin Hotel
- 25.- 26. Sept: - Scientific meeting, Ringholmen
- 8th December - Scientific meeting, Bårdshaug Herregård

## **Visitors**

Approximately 90 groups have been visiting, including personnel participating in courses. Total number of visitors was 640. These visits have been conducted as guided tours, lectures, meetings and courses with transmission of live operations to the auditorium. 23 of these visits were from abroad. 30 different countries have been represented. These groups have consisted of health care professionals, hospital planners, hospital administrators, members of the Norwegian Parliament, state department employees, architects, representatives from the industry, researchers and journalists. Medical students from our university and several other groups have had lectures and transmissions from the operating rooms. 40 transmissions from the operating room to the auditorium have been performed.

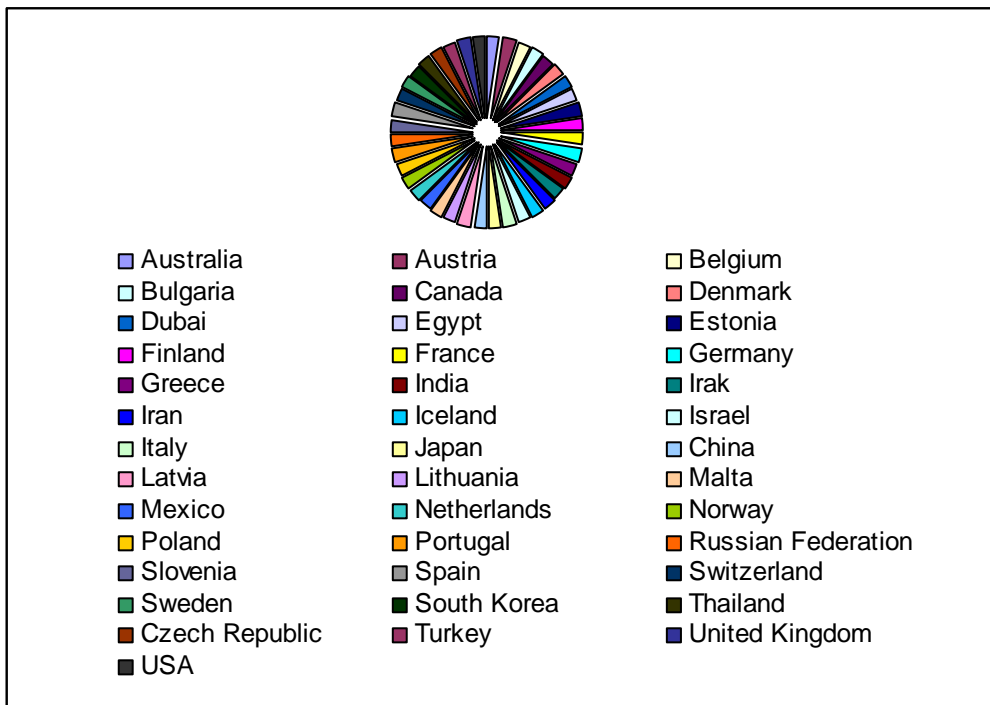
In addition, ORF has received several groups internally from St. Olavs Hospital and Hospital Development Project for Central Norway, our hospital contractor.

The presentations given on those occasions have been made by representatives from St. Olavs Hospital, NTNU and SINTEF.

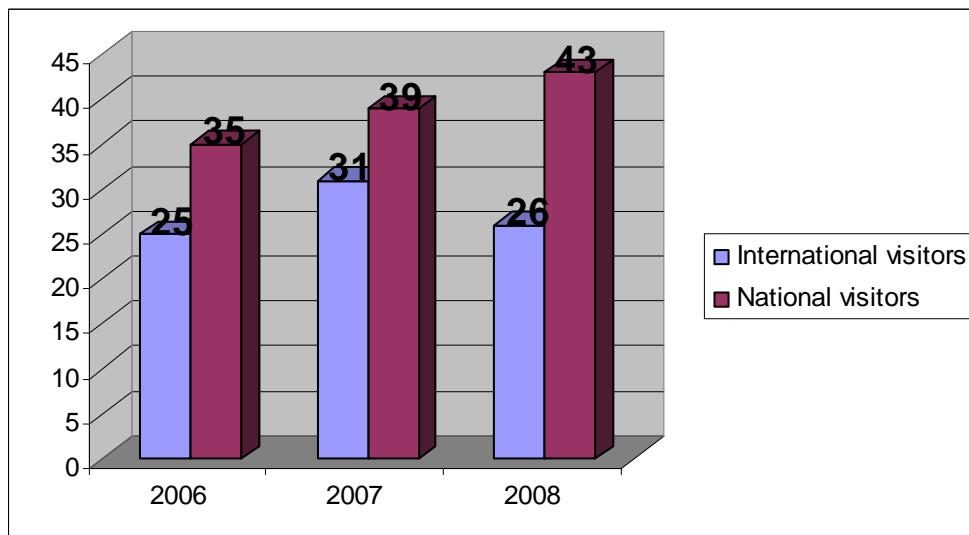
Operating room nurses, x-ray technicians, anaesthesia nurses/doctors, radiographers and surgeons from both national and international hospitals have visited the operating rooms at ORF.



**Visitors at ORF 2005 – 2008  
40 different nationalities**



**Visitors at ORF 2005 - 2008**



**Altogether: International groups visiting ORF: 82**  
**National groups visiting ORF: 117**

The total number of visitors since the opening in May 2005 is 2400.



## Upgrading of medical technology in ORF

- EndoAlpha for laparoscopic procedures, upgrading and extension, OR2
- Endobase, implementing endoscopic procedures, OR2
- Development of wireless communication between video sources and visualising hardware.
- Upgrading of Angiolab and DynaCT with new software, OR1
- Implementing electronic patient records in OR1 and OR2
- Replace and upgrading of flat screens for laparoscopic procedures with latest version, full HD 1920 x 1080 input, OR2
- Further developing HD/SDI interface from OR1 and OR2 to Sony-HD structure, making it possible to transmit HD-format out of ORF through videoconferencing and fiber technology to all clinics at St. Olavs Hospital and other hospitals.
- Replacing and upgrading flat screens in the auditorium, further development of HD.
- Installing and upgrading fiber connection and technology by Network Electronics from ORF in collaboration with Midgard Medialab.
- Performing transmission in live HD from OR2 and OR1 to Nova cinema and Yonsey University Hospital in Korea.
- Upgrading server and webstructure in Sony-structure, AV/IT
- Programming all touchpanels to make them compatible multiple types of hardware
- Implementing new platform for high energetic equipment, diathermy and ligasure
- Implementing laser technology for urologic procedures and urethroscopies

Replacement and upgrading of technology throughout 2008 has a total value of NOK 2.900.000,- , this expenditure has been covered by our industrial collaborators through the existing agreements.

## ***Research and development***

### **Supervision**

Hans Olav Myhre (scientific advisor ORF) has in 2008 been supervising three PhD-candidates.

He was also appointed referee for evaluating a full professor appointment in vascular surgery in Oslo and Bergen, Norway.

### **National and international committees**

Ronald Mårvik: Leading the national task force responsible for the report: “Workup and treatment of morbid obesity in secondary health care”.

Ronald Mårvik: Committee member Technology Committee and NOTES - Committee in European Associations of Endoscopic Surgery.

Ronald Mårvik: Member of governing board Norwegian Bariatric Association and Norwegian Thoracoscopic Union.

Torbjørn Dahl: Norwegian council member in European Society for Vascular Surgery.

Hans O. Myhre: Member of the council, European Society for Nanomedicine, and was also one of the founders.

## **Theses, master degrees, bachelor degrees and other projects**

### **Completed bachelor degrees**

Two student projects have been completed as collaboration between ORF and Sør-Trøndelag University College. Each of these has resulted in bachelor degrees.

#### **Project 1**

Marianne Gårderhagen, Marianne Hauge, Kristin Holum.

X-ray dose registration in personnel at ORF1 using TLD-crystals. Department of radiography, Sør-Trøndelag University College.

## **Project 2**

Erlend Klakken, Edmund Reiten and Morten Rindal Øvsteng.

X-ray registration of phantom at ORF1 and analysis of images. The project is linked to the PhD-thesis of Kari Ravn Eide. Department of Radiography, Sør-Trøndelag University College.

## **Ongoing master degrees**

There are two ongoing master degrees in health science associated with ORF.

Jenny Kristin Aasland, completion planned 2009.

Anne Karin Wik, completion planned 2011.

## **PhD - programs**

### **Ongoing PhD studies**

**Frode Manstad-Hulaas**, MD, Medicine/medical technology

”3D image guided navigation for aortic stentgrafting”

Use of navigation when applying a stentgraft with sidearms. By using navigation and DynaCT intraoperatively, one intends to make this procedure safer and simpler. A project based on experiments on a model has been published. Three ongoing projects; One experimental study, one patient study with navigation using EVAR and a study evaluating 3D-3D registration. The candidate has presented 3 papers internationally in 2008. Completion of PhD is planned in 2010.

**Håvard Nordgaard**, MD, Medicine/medical technology

“Ultrasound based blood flow imaging for control of cardiovascular surgery”. This project investigates the use of ultrasound for evaluation of reconstruction of coronary vessels and surgical procedures for stenosis of the carotid artery. The candidate is supported financially through MI lab from 2009.

**Berit Brattheim**, MSc, Health/medical technology

“Support for decision making when selecting AAA patients for treatment with stentgraft”/”Aortic aneurysm network”

This activity is done in collaboration with Department for Electronic Patient Records, NSEP. A part study on identifying and describing workflow when selecting patients for possible stentgrafting is published. Three ongoing projects; one connected to the COSTT-project. The candidate has presented one paper internationally in 2008. Completion of the PhD is planned in 2011.

**Kari Ravn Eide**, MSc, Health/medical technology

“DynaCT for endovascular treatment of abdominal aortic aneurysm”

DynaCT is a new technology where a C-arm linked to the angio-lab rotates and gives CT-like images during the intervention. The whole angio-lab is integrated with an operating table for treatment of vascular diseases at ORF. Two parts of the study has been completed and published. Three ongoing projects. The topics are preoperative imaging, x-ray load when using DynaCT and image quality of the upgrading of software. PhD planned completed in 2010.

**Ole Vegard Solberg**, MSc, Medical technology

“3D ultrasound for improved diagnosis and surgical guidance; - reconstruction and integrating of preoperative image data”. Two articles have been published and the next study has been initiated. The candidate has presented one paper internationally in 2008. This thesis is done in collaboration with the Center of Competence for 3D-ultrasound. The PhD is planned completed in 2010.

**Andreas Seim**, MSc, Logistics

“Logistics in operating departments”

Process analysis and improvement of operating units at the hospitals. The thesis was defended April 24, 2009.

**Anna Aasgaard Rethy**, MD, Medical technology

“The role of navigation and intraoperative imaging in laparoscopic surgery”

Two referee articles are in the process of completion. PhD planned completed in 2011.

**Reidar Brekken**, MSc, Medical technology

“Strain measurement in evaluating abdominal aortic aneurysm (AAA)”

Strain in the aortic wall investigated for evaluating the possibilities for rupture. A paper discussing the methodology has been published. Evaluation of strain before and after EVAR-treatment has also been published. New studies are being initiated. This thesis is done in close collaboration with Center of Competence for 3D-ultrasound.

## **Part study of PhD**

**Tor Erik Evjemo**, PhD, Sociology

An ethnographic research design used in studies for identifying work related activities in areas of collaboration and communication, Focusing on mode of collaboration in a technologically complex environment. A part study focusing on video recordings of communication/use of information in a high-tech setting in ORF, has been done. Employees have been interviewed and a publication from this work is under preparation.

**Håkon Olav Leira, MD, Medicine**

“The application of DynaCT for bronchoscopy and endobronchial procedures”

The first part project has been completed at the ORF as an experimental study. A paper discussing this is under preparation. The project is supervised by Tore Amundsen, Department of Pulmonary Diseases.

### *Navigation with Custus X*



### **Studies / projects / national and international collaborators**

- An excellent working relationship with our most important industrial collaborators has been established. First among these are SONY, Siemens and Olympus. Agreements have been reached with Covidien and Medistim.
- ORF has close collaboration with Sør-Trøndelag University College, the Medical Faculty of NTNU, National Center for Advanced Laparoscopic Surgery, SINTEF Health and National Center of Competence for 3D ultrasound.
- Comparison of surgery (gastric bypass) with life style modification in morbid obesity. This is a 5 years study being run by the Center for Morbid Obesity at St. Olavs Hospital. The patients included for surgical treatment are operated at ORF.
- “The application of navigation by DynaCT in patients with anal incontinence”. A pilot study was completed in 2007 and the main study started up i 2008. A number of patients are now included and treated by Astrid Rydning, MD, PhD.
- Project “The efficacy of exercise before gastric bypass”. Tissue samples are taken pre- and intraoperatively to estimate whether the gene expression in tissue is being changed in patients as a consequence of preoperative physical training. The intraoperative sample is taken in connection with gastric bypass procedure at ORF. This is a collaborative effort between NTNU and Center for Morbid Obesity at St. Olavs Hospital.

- University of Tübingen, Germany. Collaboration concerning development of an ergonomical grip for laparoscopic instruments
- University Hospital, Barcelona. A collaborative effort evaluating the use of Olympus data technology in the operating room.
- European Association of Endoscopic Surgery: The Trondheim group has members in one of the NOTES-committees.
- University of Krakow. Intention on collaboration in EU-project within the field of flexible endoscopy.
- Independent Public Medical Care Unit Military Hospital, Szczecin. EU-application in the field of teaching and training.
- Montsouris University Hospital, Paris. A study visit at Prof. Brice Gayet's unit for laparoscopic liver surgery.
- Steinberg University, Berlin, Visiting Prof. Marc Schurr in his animal lab in connection with VECTOR project and work on OTSC-chips for closing gastric perforations in NOTES procedures.
- A collaborative effort has been established with the Mesos Medical Center, Utrecht, The Netherlands, in connection with navigation in laparoscopy. A signed agreement has been reached for a multicenter study using the same protocol.
- Electromagnetic positioning in the operating room. Work has been done to evaluate the potential and precision of electromagnetic position and direction measurements in real-time conditions in several types of operating rooms. A number of surgical instruments have been used to study possible impact on these measurements. A paper describing the results from these measurements is in preparation. The main conclusion is that the electromagnetic positioning is feasible, and the work will go on with the intention of using this positioning device in both intravascular navigation and 3D laparoscopic ultrasound.
- 3D ultrasound in laparoscopy. A solution based on micropositioning and flexible ultrasound probe to be integrated in the navigation of system CustusX is being developed. The ultrasound application has so far been tested under lab-conditions to evaluate the degree of precision. This work will be continued as laboratory experiments in 2009, primarily by comparing acquired ultrasound images with corresponding images acquired through the DynaCT scan. This project will be included in two master degrees and one PhD-thesis.
- High-definition video in laparoscopy. A comparative study aimed at evaluating the clinical significance of high-definition versus standard definition images. The images will be acquired from the same trocar opening where both types of scopes will be pointing towards the same organ. The images will then be compared by independent observers.

- Mapping of complications after operating table positioning of patients undergoing laparoscopic gastric bypass. The data collection has been done and the paper has been submitted for publication.
- Olympus has developed a prototype for new operating room light source replacing the traditional lights. This is a collaborative effort between ORF and Olympus.
- Siemens in collaboration with ORF are developing a prototype for new operating light in vascular/endovascular therapy. The prototype is being mounted and evaluation has been done.
- Collaborative effort has been established between Sony Corporation, Kano M, Liverød V and Skogås JG, for a study of the use of holograms and 3D-displays in the operating room.
- Evaluating air quality in the operating rooms  
This is a collaborative effort between the Unit for Hospital Hygiene and ORF at St. Olavs Hospital and Sør-Trøndelag University College. The project has been financed through support from the local health trust. Measurements of air quality have been carried out in new operating room at St. Olavs Hospital compared to similar facilities in the old surgical operating department, in order to compare air quality in different surgical environment. This work is completed and the report has been handed over to the hospital authorities.
- “Microbiological investigation of mobile medical equipment at the operating rooms at St. Olavs Hospital”. A collaborative effort involving unit for hospital hygiene and ORF at St. Olavs Hospital and Sør-Trøndelag University College. The purpose is to investigate the possible contamination of technical equipment being moved from one operating room to another.
- An ongoing collaboration with the Technische Universität München concerns the pre- and peroperative registration of CT-images. This is part of the PhD-thesis of Frode Manstad-Hulaas and his counterpart in München is Stefanie Demirci at CAMPAR (Chair for Computer Aided Medical Procedures & Augmented Reality), Fakultät für Informatik. Siemens Medical Solutions also takes part in this project.
- Collaborative effort for integration of electromagnetic sensors in guide wires. This is part of the PhD-thesis of Manstad-Hulaas, in collaboration with Lucian Gruionu, associate professor at the Advanced Engineering Group, University of Craiova, Romania, and professor Kevin Cleary, The Imaging Science and Information Systems (ISIS) Center, Georgetown University Medical.
- A collaborative effort has been established with Massachusetts General Hospital (MGH) in Boston in the field of logistics. Andreas Seim (MSc) has been visiting MGH and established working relationship with Warren Sandberg (MD), Department of Anaesthesiology, MGH. We are planning to get a position as adjunct professor at NTNU for Warren Sandberg and look forward to future cooperation with him and his group.

- National Center of Advanced Laparoscopic Surgery is through Ronald Mårvik represented as a member in Technology committee EAES, which is responsible for a European symposium every year. Through this working relationship ORF is used as an arena to demonstrate new concepts as well as established procedures.
- The EU-project VECTOR (Versatile Endoscopic Capsule for gastrointestinal Tumor recognition and therapy) is a large EU-project with 18 participants, including SINTEF and clinicians at St. Olavs Hospital through SMIT (Society for Medical Innovation and Technology). The project is focusing on the use of micro-technology for early detection and treatment of cancer in the GI-tract. The project was initiated in September 2006 and is planned for 4 years. ORF will become an arena for testing prototypes within this project.
- An established collaborative effort between NSALK / ORF and AV Arena Norway through Midgard Medialab, NTNU. The main focus of AV Arena Norway is to strengthen Norway as a leading international scientific agent within the field of new digital medias and increasing Norwegian industrial and commercial activity tied up with this. Midgard medialab has been involved in HD transmission to NOVA cinema from ORF in connection with conferences. In 2008 a transmission was arranged from ORF to Yonsei University Hospital in Korea. A working agreement has been reached with Yonsei University Hospital through NTNU.
- A project has been initiated to develop a model for systematic training of operating room personnel involved in prosthetic hip replacement. “Primary prosthesis for hip fractures”. This project originated with the Orthopaedic clinic through Lars Johnsen and Otto Schnell Husby.



**CT-scan demonstrating stent-graft in the aorta and pelvic arteries**

## Publications

### Vascular/endovascular therapy

#### Articles in international journals with peer review

Dahl T, Cederin B, Myhre HO, Indredavik B. The prevalence of carotid artery stenosis in an unselected hospitalized stroke population. *Int Angiol* 2008; 27:142-5

Lange C, Aasland JK, Ødegård A, Myhre HO. The durability of EVAR – What are the evidence and implications on follow-up? *Scand J Surg* 2008;97:205-212

Eide KR, Ødegård A, Myhre HO, Lydersen S, Hatlinghus S, Haraldseth O. DynaCT during EVAR – A comparison with multidetector CT. *Eur J Vasc Endovasc Surg.* 2009;37:23-30.

Frode Manstad-Hulaas, Geir Arne Tangen, Asbjørn Ødegård, Petter Aadahl, Toril AN Hernes. Needle Navigation for Treatment of Type II Endoleak: Case Report. *IJCARS.* 2008, Volum 3, Supplement 1, 64-66.

Lucian Gruionu; Frode Manstad-Hulaas; Emmanuel Wilson; Patrick Cheng; Teo Popa; Justin Lee; Filip Banovac; Kevin Cleary. Design, Construction, and Evaluation of an Electromagnetically Tracked Guidewire for Interventional Radiology and Surgical Applications. *IJCARS.* 2008, Volum 3, Supplement 1, 124-125.

Demirci S, Kutter O, Manstad-Hulaas F, Bauernschmitt R, Navab N. Advanced 2D-3D Registration for Endovascular Aortic Interventions: Addressing dissimilarity in images. Navab N. *SPIE2008, Conference San Diego. Proc. SPIE, Vol. 6918, 69182S (2008); DOI:10.1117/12.769835*

Berge C, Haug ES, Romundstad PR, Lange C, Myhre HO. Improved long-term survival following infrarenal abdominal aortic aneurysm repair. *Scand Cardiovasc J* 2008; 42: 354-59

Jensen SA, Vatten LJ, Myhre HO. The association between diabetes mellitus and the prevalence of intermittent claudication. *Vasc Med* 2008; 13: 239-44

Brekken R, Dahl T, Hernes TAN, Myhre HO. Reduced strain in abdominal aortic aneurysms after endovascular repair. *J Endovasc Ther* 2008;15:453-461

#### Presentations at international conferences. Invited speaker.

Myhre HO. The durability of EVAR – What are the evidence and implications on follow-up? Bergqvist symposium, Uppsala, 22-23 mai 08. Invited speaker

Myhre HO, Ødegård A. Aortic Dissections. ESVS Revision Course at the Annual Meeting of European Society for Vascular Surgery, Nic, Sept 4<sup>th</sup> 2008. Invited speaker.

Myhre HO, Haaverstad R. Prevention of postoperative paraplegia during thoracoabdominal aortic surgery: Current techniques and results. Aortasymposium, Liege, Belgia, Sept 19<sup>th</sup> 2008. Invited speaker

Myhre HO. Training in vascular surgery - "The Scandinavian model". XXII World Congress of the IUA, June 21-25, 2008, Athens. Invited speaker.

### **Other presentations at international conferences.**

Manstad-Hulaas F, Tangen GA, Ødegård A, Aadahl P, Hernes TAN. Needle Navigation for Treatment of Type II Endoleak: Case Report. IJCARS, Volum 3, Supplement 1, 64-66, 2008.

Gruionu L, Manstad-Hulaas F, Wilson E, Cheng P, Popa T, Lee J, Banovac F, Cleary K. Design, Construction, and Evaluation of an Electromagnetically Tracked Guidewire for Interventional Radiology and Surgical Applications. IJCARS, Volum 3, Supplement 1, 124-125, 2008.

Myhre HO. Classical operation and reoperation of the great saphenous vein – cosmetic results. Scandinavian forum for venous diseases, Trondheim, 29.-30. May 2008.

Aasland J. The history of vascular surgery – how will treatment develop? Nordic congress for vascular surgical nursing, 22.-23.05.08

Aasland, J. Thoracic aneurysms, a comparative study of open and endovascular treatment. Nordic congress for vascular surgical nursing, 22.-23.05.08

Kasseth AM, Karlsen C. Team approach in an interventional operating room – ORF. Nordic congress for vascular surgical nursing, 22.-23.05.08

Ødegård A. Patients with acute thoracic aortic rupture  
Nordic congress for vascular surgical nursing, 22.-23.05.08

Dahl T. Carotid artery stenosis and emboli – are we able to identify the most dangerous plaques? Nordic congress for vascular surgical nursing, 22.-23.05.08

Lange C. Long-term results for AAA patients.  
Nordic congress for vascular surgical nursing, 22.-23.05.08

### **Presentation at national conference**

Myhre HO. Vascular surgery – ethics, attitudes, teaching and handling. University course. Scientific Proceeding, Norwegian Surgical Society, 21. October, 2008

### **Lecture at regional conference**

Manstad-Hulaas, F. Navigation in connection with EVAR, Mid-Norway Vascular Surgical Forum, November 2008, Trondheim

### **Abstracts/poster**

Eide KR, Haraldseth O, Myhre HO, Odegard A, Hatlinghus S. Rotational angiography: the effect of different contrast doses on visibility of anatomical structures. CARS, Barcelona, Spain, 25-28 June, 2008.

Demirci S, Kutter O, Manstad-Hulaas F, Bauernschmitt R, Navab N. Advanced 2D-3D registration for endovascular aortic interventions: Addressing dissimilarity in images. Poster presentation at SPIE 2008.

### **Abstracts**

Seternes A, Dahl T, Myhre HO. Time from symptoms to carotid endarterectomy. Norwegian Surgical Winter Meeting, Geilo, March 2008. Prize for best free lecture by doctor in training. The "Micromed" prize.

Myhre HO. Classical operation and reoperation on the great saphenous vein – cosmetic result. Scandinavian forum for venous diseases, Trondheim, 29.-30. May 2008.

Myhre HO, Laxdal E, Schroeder T, Lepäntalo M, Swedenborg J. Training in vascular surgery – The „Scandinavian model“. Included in the Proceedings of the 20<sup>th</sup> International Congress on Thrombosis. June 25-28, 2008, Athens, Greece

Lange C, Hatlinghus S, Ødegård A, Aasland J, Myhre HO. The value of follow-up routines after endovascular treatment of AAA. Scientific proceedings, Norwegian Surgical Society, Oct. 2008

Lange C, Hatlinghus S, Ødegård A, Aasland J, Myhre HO. 13 years of stentgraft treatment for abdominal aortic aneurysms. Scientific proceedings, Norwegian Surgical Society, Oct. 2008

Lange, C. Stentgraft treatment of diseases in thoracic aorta in Trondheim 1997-2008. Winter meeting of Norwegian Surgical Society, Geilo, 7.-9. Mars 2008

## **Book chapter**

Myhre HO, Haaverstad R. Prevention of postoperative paraplegia during thoracoabdominal aortic surgery: pp 283-295 in Current techniques and results. Sakalihan N, Kuivaniemi H, Michel JB "Aortic Aneurysms, New insights into an old problem". Les Editions de l'Université de Liege, 2008

## **Laparoscopic surgery**

### **Articles in international peer-reviewed scientific journals**

D.Büchel, B.Hallabrin, R.Marvik, U.Matern. Ergonomics of four different handles for minimally invasive surgery. Experimental-OR and Ergonomics. University Hospital of Tübingen, Germany and National Center for Advanced Laparoscopic Surgery, Surgical Department, St. Olavs University Hospital, Trondheim Norway (Submitted okt-2008)

Magnus Strømmen, Bård Kulseng, Einar Vedul-Kjelsås, Gjermund Johnsen, Ronald Mårvik. Bariatric Surgery or Conventional Treatment ? Severely Obese Patients' Motivation for Two Different Treatments. Centre for Obesity, National Centre for Advanced Laparoscopic Surgery, Future Operating Room, Dept of Surgery. St. Olavs Hospital and Dept of Neuroscience, The Norwegian University of Science and Technology (Submitted 2008).

M. Camillieri, J. Toouli, M.F. Herrera, B. Kulseng, L. Know, J.P. Pantoja, R. Mårvik, G. Johnsen, C.J. Billington, F.G. Moody, M.B. Knudson, K.S. Tweden, M. Vollmer, R.R. Wilson, M. Anvari. Intra-abdominal vagal blocking (VBLOC therapy): Clinical results with a new implantable medical device. Surgery 2008,143;6:723-731

Solberg OV, Langø T, Tangen GA, Mårvik R, Ystgaard B, Rethy A, Hernes TAN. Navigated ultrasound in laparoscopic surgery. Minim Invasive Ther Allied Technol (MITAT), 14:1-18, 2008.

Langø T, Tangen GA, Mårvik R, Ystgaard B, Yavuz Y, Kaspersen JH, Solberg OV, Hernes TAN. Navigation in laparoscopy - Prototype research platform for improved image-guided surgery. Minim Invasive Ther Allied Technol (MITAT), 2008; 17:1:17-33.

Langø T, Nesbakken R, Færevik H, Holbø K, Reitan J, Yavuz Y, Mårvik R. Cooling vest for improving surgeons' thermal comfort: A multidisciplinary design project. In press, Minim Invasive Ther Allied Technol (MITAT), 2008.

### **Articles in international scientific journals**

Solberg OV, Tangen G-A, Lindseth F, Sandnes S, Enquobahrie A, Ibáñez L, Gobbi D, Cleary K. Integration of a real-time video grabber component with the open source image-guided surgery toolkit IGSTK. Proceedings of Medical Imaging 2008: PACS and Imaging Informatics, San Diego, CA, USA: SPIE, 2008;6919:69190Z-69199.

### **Presentation at international scientific conference. Invited speaker**

Mårvik, R. VBLOC, a new treatment modality in bariatric surgery.  
Norwegian Surgical Society. Symposium; Surgical treatment of morbid obesity. 21st Oct  
2008

### **Presentation at national course**

Mårvik, R. Course for general practitioners. Obesity 2.- 4. March 2008. Course leader and  
lecturer.

### **Presentations at international scientific conferences. Invited speaker.**

Mårvik, R.

1. The fully integrated endoscopic OR
  2. Navigation in MIS
  3. Telemedisin in Norway
- Egyptian Society of Surgeons, Cairo 20 – 22 Jan-08

Mårvik, R.

1. The endoscopic OR for the 21st century
  2. Navigation in laparoscopic surgery.
  3. The new St.Olav Hospital
  4. Education in laparoscopic surgery
- Lithuanian Surgical Society Klaipeda 15.-16.mai 2008

Mårvik, R. The future of TEM.4.European Surgical Forum 2008, Mallorca 12. – 14.  
September

Mårvik, R.

1. The Future OR at St.Olavs Hospital
  2. New technology in Baraiatric surgery
  3. Navigation in laparoscopic surgery
  4. Antipacing technology in obesity
- EAES Congress, Stockholm, 11. – 14 Juni-2008

Mårvik,R. New technology for NOTES. Italian Surgical Society Rome 20.okt 2008

Mårvik, R

1. OR, new equipments
  2. Training in laparospic surgery in the 21th century
- Euro-Mediterranean & Middle East Laparoscopic Meeting - Bordeaux (France) - 13-15  
November 2008

Mårvik, R.

1. OR of the future
2. Education in endoscopic surgery

European Society of Surgery, 27.-29. Nov, 2008. Napoli  
Mårvik, R.

1. The future endoscopic operating room

2. New technology in NOTES

International conference, Advances in surgery Barcelona 10. – 11. Dec.2008.

Mårvik, R. Visiting Professor 3. – 12. Jan-08 Havana Endoscopic Center

Langø T et al. The need for navigation in MIS. Invited lecture at the Surgical Endoscopy Expert Summit 2008, Tromsø - Trondheim, May 6-9, 2008.

Langø T et al. Actual and future requirements and expectations of RF ablation. Invited lecture at the Surgical Endoscopy Expert Summit 2008, Tromsø - Trondheim, May 6-9, 2008.

### **Presentations at international scientific conferences**

Johnsen, G. The use of Ligasure Advance in laparoscopic gastric bypass. SAGES (USA).

Johnsen, G. The use of Ligasure Advance in laparoscopic gastric bypass. EAES Congress, Stockholm, 11. – 14 Juni-2008.

Langø T, C.F.P. van Swol, G.A. Tangen, O.V. Solberg, B. Ystgaard, T.N. Hernes, A. Rethy, L.M. de Brauw, A.B. Smits, R. Mårvik. Navigation technology and augmented reality in laparoscopy. Oral presentation at the 20th annual SMIT (Society for Medical Innovation & Technology) congress, Vienna, Austria, 28-30 August, 2008.

Langø T, O.V. Solberg, G.A. Tangen, B. Ystgaard, A. Rethy, T.N. Hernes, R. Mårvik. Navigated ultrasound in laparoscopic surgery. Oral presentation at the 20th annual SMIT (Society for Medical Innovation & Technology) congress, Vienna, Austria, 28-30 August, 2008.

Langø T, S. Muller, R. Brekken, A. Seternes, B. Ystgaard. Degrees of bowel adhesion after repair of ventral incisional hernias: an ultrasonic method. Oral presentation at the 20th annual SMIT (Society for Medical Innovation & Technology) congress, Vienna, Austria, 28-30 August, 2008.

Muller S, Langø T, Brekken R, Seternes A, Ystgaard B. Degrees of bowel adhesion after repair of ventral incisional hernias: an ultrasonic method. Presentation at Computer Assisted Radiology and Surgery (CARS), Barcelona, Spain, June 25-28, 2008.

Solberg OV, Tangen G-A, Lindseth F, Sandnes S, Enquobahrie A, Ibáñez L, Gobbi D, Cleary K. Integration of a real-time video grabber component with the open source image-guided surgery toolkit IGSTK. Oral presentation at the SPIE Medical Imaging - PACS and Imaging Informatics, San Diego February, 2008.

## **Abstract**

J. Toouli, L. Kow, B. Kulsen, R. Mårvik, G. Johnsen, U. Keller, D.M. Frey, K.S. Tweden, R.R. Wilson, C.J. Billington, F.G. Moody. Vagal blocking for obesity control (VBLOCTM): Ongoing comparison og weight loss with two generations of an active, implantable medical device.Oral presentasjon ASMBS.

## **General FOR**

### **Articles in national journals**

Warren S. Sandberg, Elisabeth H. Sandberg, Andreas R. Seim, Shaji Anupama, Jesse M. Ehrenfeld, Stephen F. Spring & John L. Walsh, Real-time Checking of Electronic Anesthesia Records for Documentation Errors and Automatically Text Messaging Clinicians Improves Quality of Documentation, *Anesthesia and Analgesia*, 2008; 106, 1:192-201

Mark A. Meyer, Andreas R. Seim, Pamela Fairbrother, Marie T. Egan, Warren S. Sandberg, Automatic Time-Motion Study of a Multistep Preoperative Process. *Anesthesiology*, 2008; Jun;108(6):1109-16

Seim AR, Fagerhaug T, Ryen SM, Curran P, Sæther OD, Myhre HO, Sandberg, WS. Causes of cancellations on day of surgery at two major university hospitals. Accepted, *Surgical Innovation* Dec 08

Brattheim B, Seim AR, Faxvaag A. Clinical processes in an innovative vascular surgeon community. Implications for workflow modelling. *Stud Health Technol Inform* 2008; 136: 371-6

### **Article in national scientific journal**

Kvam A, Brattheim B, Vutudal V. The bacterial level in the air in ORF. *The Bioengineer*, 8, 2008; 6-10

### **Presentation at international conferences. Invited speaker**

Mårvik R et al. The FOR at St.Olavs Hospital. Invited lecture at the Surgical Endoscopy Expert Summit 2008, Tromsø - Trondheim, May 6-9, 2008.

Seim, A, Faxvaag, A, Sandberg, WS, Toussaint, P, Co-Operations Through Transparency, (Paper) Presented at the 2008 International Annual EurOMA Conference

## **Presentation at international conferences**

Brattheim B, Seim AR, Faxvaag A. Clinical processes in an innovative vascular surgical community. Implications for workflow modelling. Medical Informatic konferansen, Gøteborg, 26.-28. mai 2008

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Are cold light sources really cold? January 2008: New York Medical Center, USA.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Workshop Medical ICT and Media Technology, NTNU, Midgard Media Lab, AV Arena Norway, February 2008, Oslo

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. "Medical Holography Project". January 2008: Sony, New York, USA

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. The structure and logistics in the Future Operating Room. May 2008, Yonsei University, Seoul, Korea.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. The modern AV-ICT and challenge of Visible Light in PACS, May 2008, Yonsei University, Seoul, Korea.

Skogaas JG, Future Operating Room in Trondheim, St.Olavs Hospital, Norway. The modern AV-ICT in minimal invasive surgery. June 2008: ENT Conference, Nova, Trondheim

## **Presentations at national conferences**

Langø T et al. Navigational technology and visualisation of medical data in ORF. Invited lecture. National conference Teaching of physics. Gol, Norway, 10.-13. August, 2008.

Myhre HO, Skogås JG. Operating Room of the Future. Medical technology, 7.-8. May 2008

## **Presentations at visits, courses and conferences at ORF**

Myhre HO. Visit at ORF by Patrick Beasseu 22.01.08

Myhre HO. Ultrasound guided vascular surgery. Oral presentation at the meeting of the Reference group, National Center for 3D Ultrasound in surgery, Trondheim 22.04.08

Myhre HO. FOR - Video transmission from the vascular OR and presentation of the vascular group. (COSTT-project) NSEP/SINTEF/NTNU 23.04.08

Myhre HO. Presentation ISB, ORF, 10. June, 2008

Myhre HO. ORF - Ringholmen-seminar 25.-26. Sept. 08

Aasland, J. "Operating Room of the Future. Experience with projects". Scandinavian Forum for vein diseases, 29. May, 2008, Trondheim

Skogås JG. Modern AV-ICT in medical technology at ORF, St.Olavs Hospital, Focus on safety aspects, hospital management. January 2008.

Liverød V, Skogås JG. AV-ICT and Sony PACS, course for specialist users at St Olavs Hospital, March 2008.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development. Visit by hospital planners, Finland, februar 2008.

Skogås JG. ORF, St. Olavs Hospital. Issues on medical technical equipment, course in hygiene and patient safety for technologists/researchers at ORF, February 2008.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. Visit by neurosurgeons, university hospitals abroad, February 2008.

Skogås JG. Technology of the endoscope, clinical conditions and high energetic technology. Single day course for operating room nurses training, Sør-Trøndelag University College, St. Olavs Hospital, January 2008.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. Course for urologists, transurethral, April 2008.

Skogås JG. Future Operating Room in Trondheim, St.Olavs Hospital, Norway. Project and development, modern AV-ICT. Visit via Sony and Olympus, June 2008.

## **Popular Science**

"Bioengineer students in Trondheim are doing research on hospital bacterial contamination". Interview with A Kvam in the periodical Bioengineer.  
<http://www.nito.no/dm/public/182397.PDF>

## **Visual media**

"Norway learns from Korea"  
<http://www1.nrk.no/nett-tv/nyheter/spill/verdi/61531>

## **Net publications**

Collaborative effort St.Olavs Hospital, ORF and Yonsei University Health, System, Korea 19.06.2008.

[http://cms1.rit.no/StOlav/FOR/Nyheter/samarbeidsprosjekt\\_stolavs\\_hospital\\_og\\_yonsei\\_korea.htm?s\\_CMS\\_Target=innvortes](http://cms1.rit.no/StOlav/FOR/Nyheter/samarbeidsprosjekt_stolavs_hospital_og_yonsei_korea.htm?s_CMS_Target=innvortes)

## **Popular scientific interview**

”Through medical technology one can reap larger benefits”. Helse/medisin/teknikk nr.2, april 2008.

[http://project.vbook.no/project.asp?version\\_id=189&page=32](http://project.vbook.no/project.asp?version_id=189&page=32)

## **Honours**

Myhre, Hans Olav. Appointed honorary member of European Society for Vascular Surgery, Nic, Sept 4<sup>th</sup> 2008

Seternes A, Dahl T, Myhre HO. Time interval from onset of symptoms until carotis endarterectomy. MICROMED prize. Winter meeting of Norwegian Surgical Society, March 2008

## **Exhibitions**

Researcher Night. The research days in Norge. Navigation in minimal invasive surgery – Try yourself as a neurosurgeon. Responsible for the exhibit: Geir Arne Tangen. Arranged by Researchers Night: NTNU, Trondheim. 26. September, 2008.



## Scientific activity 2008

Articles international journals	20
Articles national journals	1
Presentations at international conferences	39
Presentations at national conferences	7
Presentations visits at ORF	14
Abstract/posters	10
Book chapter	1
PhD-thesis	0
Ongoing PhD	7
Part studies PhD	2
Ongoing master degrees	2
Bachelor degrees	2
Printed media articles	4

## ***Economy / results 2008***

In NOK 1000

	<b>Account 2008</b>	<b>Transferred to 2009</b>
Disposable equipment	43	
Salaries	1 558	
Technical equipment	6	
Other costs	158	
Internal costs	507	
Overhead 15 %	341	
<b>Total costs</b>	<b>2 613</b>	
<b>Research grants 2008</b>	<b>2 580</b>	
<b>Result 2008</b>	<b>-33</b>	
<b>Positive balance transferred to 2009</b>		<b>-33</b>



## ***Future plans / ORF in the new hospital***

ORF has been up and running since 2005 and will continue within the new structure of the hospital. The aim of our activity will expand to include all clinics with surgical activity. The organisation will be similar to the present, but the activity will be disseminated to clinical centres. Altogether 6 operating rooms will be involved, connected by a modern AV-ICT structure continuing the concept of “interactive auditorium” making live transmissions and interactive communication possible in full HD. The main motive for working with the concept of ORF is to facilitate a good clinical research. At the same time it is important to be a center of competence in constructing and running operating rooms. A number of hospitals are on the planning stage, in Norway as well as abroad. Operating rooms are expensive, both in construction and in running. One often has to change the facilities shortly after completion. We wish to continue working within this field to gain more knowledge and be able to optimise solutions for operating rooms as well as reducing costs. Focal points will be architecture, use of materials, ergonomics, ICT-solutions, logistics and health economy to reduce construction costs and increase efficiency. A systematic approach is mandatory in order to develop sustainable knowledge on the subject matter.

ORF has a close collaboration with several other institutions. They represent the industry, clinical centers and technological research groups. Our main co-workers are St. Olavs Hospital, The Medical Faculty, NTNU and the research foundation SINTEF Health. Various centers of competence such as “The Center of Competence for 3D-ultrasound“ and NSALK as well as Sør-Trøndelag University College are important collaborators and will remain so in the future. There is a demand for a basis to finish master degrees. Thus, ORF has shown to be a good arena for this kind of research and we hope that this cooperation will continue in the future. The many applications received in this field are an indication of this fact. ORF is also an excellent platform providing infrastructure for the established COSTT-project, which is investigating working relationships in a surgical department.

We wish to strengthen our international activity. There are a large number of international actors wishing to collaborate with ORF. So far we have focused on Massachusetts General Hospital, Boston, Operating Room of the Future in Tübingen and research groups at Krakow University in Poland. We also have an established relationships within Imperial College in London. ORF has ties to EAES, SMIT and different patient registers. In 2008 collaborative efforts was established with Yonsei University Health System, Seoul, Korea, through Midgard Medialab. Geriatric medicine, intelligent hospital and transmission of high-quality medically information are some of the projects that have been initiated and will receive a lot of attention in the next few years.

The number of research candidates could have been increased at ORF if economy and supervisory facilities had allowed this. The candidates are financed through external funding. This has made it possible to maintain a good scientific activity in spite of a very small running budget. ORF has targeted at least one PhD and one master degree a year. One also aims to hire Warren Sandberg as adjunct professor at the unit. Sandberg has been an important supervisor for the project on logistics at ORF leading to a PhD-thesis defended in 2009. He will be a very important collaborative partner on further projects.

We wish to refine and expand indications for stent-graft treatment of aneurysms, dissections and traumas in the arterial system. This could be achieved by using a stent-grafts with sidearms for renal and mesenteric arteries. One project is to use navigation for positioning of this device. We also want to treat ruptured aortic aneurysms by endovascular therapy. This is done in collaboration with Department of Anaesthesia and Department of Radiology. Developing DynaCT function is part of an ongoing PhD-thesis. We wish to acquire two simulators for endovascular therapy connected to scientific teaching and training purposes.

We are invited to a collaboration with Department of Biomechanics for mathematic modelling of blood flow. This is a potentially valuable tool in planning procedures for stenosis in the arterial system. It can also serve as a tool for choosing the optimal stent-graft when treating for example aneurysms.

As one of the founding institutions of the European Union for Nanomedicine it is also natural that ORF starts working in the field of nanomedicine and genetic technology.

Within the field of laparoscopic surgery the use of navigation during different procedures is still the focal point. The main intention is to increase the safety of these procedures. New techniques for treating morbid obesity are being developed. An interesting principle is to use a pacemaker to stimulate the vagal nerve in these patients. This is an international multicenter study.

Also other medical disciplines are looking into the use of navigation. Treatment of pulmonary diseases, through endoscopy and endobronchial procedures has been tested out using navigational equipment. Procedures for treating anal incontinence are also being evaluated within this field. In orthopaedics, the technology is used to treat knee and spine ailments.

Systematical teaching and training of consultants and junior doctors in surgical disciplines in using electrosurgical equipment has been developed and established at ORF. This certification program has been developed for electrosurgery and fluoroscopy, where both X-ray protection and hygiene has been included. Through Health Academy at the Regional Health Trust, collaboration has been established in order to expand this arrangement to all hospitals within the trust.

Trondheim, February 2009



Jan Gunnar Skogås  
Managing Director, ORF



Hans Olav Myhre  
Scientific advisor, ORF



Torbjørn Dahl  
Responsible, Endovascular therapy



Ronald Mårvik  
Responsible, Laparoscopic surgery

## Collaborators from medical companies



## Research collaboration



[www.stolav.no/for](http://www.stolav.no/for)